



# Marine Corps Base, Camp Lejeune

## Amended Proposed Remedial Action Plan

### Operable Unit No. 12 (Site 3)

August 1998

*This Fact Sheet presents the Department of the Navy's (DoN's) Amended Proposed Remedial Action Plan (PRAP) for Operable Unit (OU) No. 12 (Site 3) at Marine Corps Base (MCB), Camp Lejeune, North Carolina. The Navy and Marine Corps have been investigating sites at MCB, Camp Lejeune as part of the Department of Defense Installation Restoration (IR) Program. The goal of the IR Program is to identify, assess, characterize, and cleanup or control contamination from past waste disposal activities. This Fact Sheet addresses only fundamental changes to the remedy selected for subsurface soils contaminated with polynuclear aromatic hydrocarbons (PAHs) at Site 3. Site history, previous investigations, extent of site contamination, and an evaluation of cleanup alternatives were presented in the original PRAP and are not reiterated in this Fact Sheet. The original PRAP for OU No. 12 was submitted on October 23, 1996 and the Record of Decision was signed on April 3, 1997.*

#### PURPOSE

MCB, Camp Lejeune and the DoN are issuing this Amended PRAP as part of the public participation responsibility under Section 117 (a) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), Section 300.430(f) of the National Oil and Hazardous Substances Pollution Contingency Plan, and the Federal Facilities Agreement (FFA) between MCB, Camp Lejeune, the DoN, the United States Environmental Protection Agency (USEPA) Region IV, and the North Carolina Department of Environment and Natural Resources (NC DENR). The purpose of this Amended PRAP is to identify the amended remedial action alternative (RAA) for the subsurface soil at OU No. 12, explain the rationale for the amendment, serve as a companion to the Remedial Investigation (RI) and Feasibility Study (FS) reports prepared for OU No. 12, solicit public review of the Amended PRAP, and provide information on how the public can be involved in the remedial action selection process. Public comments are invited and encouraged concerning the amended cleanup remedy presented in this Amended PRAP. Community involvement is critical to the selection of a final cleanup remedy as it may cause the DoN to modify the amended RAA or select another RAA.

#### OVERVIEW AND BACKGROUND

MCB, Camp Lejeune is a training base for the US Marine Corps located in Onslow County, North Carolina. The facility consists of approximately 236 square miles and includes 14 miles of shoreline. OU No. 12 is one of 18 OUs located within MCB, Camp Lejeune. Refer to Figure 1, presented on Page 2, for site location. OU No. 12 consists of Site 3 which is known at the Old Creosote Plant. Site 3 encompasses an area of approximately five acres and is generally flat and unpaved. Wooded areas lie north and east of the site. A creosote plant reportedly operated at the site from 1951 to 1952 to supply treated lumber during the construction of the Base railroad. Several structures currently exist at the site that may be remnants from the former plant including an abandoned chimney, a 240-foot long concrete pad, evidence of rail lines, and several other concrete pads scattered throughout the site.

Previous investigations conducted at Site 3 include an Initial Assessment Study (1983), a Site Inspection (1991), and a RI (1994-95). In general, these investigations indicated that the most frequently detected organic compounds were PAHs. Since creosote is comprised of PAH compounds, the PAHs detected at Site 3 are believed to be associated with past operations at the former wood treatment plant. Details regarding past environmental studies will not be addressed in this Amended PRAP but may be obtained from the original October 1996 PRAP.

#### SUMMARY OF SITE RISKS

As part of the RI, a human health risk assessment (RA) and an ecological RA were conducted to determine the potential risks associated with the chemicals detected at Site 3. The human health RA concluded that unacceptable risk values, per USEPA guidance, were generated for a future residents via exposure to groundwater contaminants. The ecological RA indicated that environmental impacts from the site would be minimal. A brief summary of the findings of the human health and ecological RAs can be found in the October 1996 PRAP.



## SCOPE AND ROLE OF ACTION

The scope of the response action for Site 3 includes two environmental media of concern: 1) subsurface soil, and 2) groundwater in the shallow aquifer. Refer to Figure 2, presented on Page 3, for delineation of the areas of concern for both media. Based upon the results of the human health and ecological RAs, groundwater was the only environmental medium that generated unacceptable risk values. To address these unacceptable risk values, it was necessary to develop a response action for groundwater. Although subsurface soil did not generate unacceptable risk values, the subsurface soil was suspected of contributing to the groundwater contamination by leaching PAHs. To address the potential for leaching contaminants, it was necessary to develop a response action for subsurface soil and one for groundwater. Thus, two sets of RAAs were developed during the FS - one for subsurface soil and one for groundwater. The complete response action for Site 3 will combine one subsurface soil alternative and one groundwater alternative. Soil remediation levels are presented in Table 1. This list has been modified from the soil remediation levels

Within this Amended PRAP, the preferred RAA for subsurface soil at Site 3 is being revised. The preferred soil remedy presented in the October 1996 PRAP and selected as the soil remedy in the Record of Decision (ROD) included source removal and on-site biological treatment of the PAH-contaminated soils in either a newly-constructed biocell or in an existing biocell. During the design of the biological treatment cell, a pilot-scale treatability study was conducted. The purpose of this study was to evaluate the effectiveness of the planned biological treatment on the target PAH compounds and to determine optimal design parameters.

The treatability study found that biological treatment would not be effective for two of the five target PAHs. Remediation levels for carbazole and benzo(a)anthracene were not reached during 112 days of biological treatment and results showed that the effectiveness of the biological treatment for these compounds was reaching static levels (i.e., results indicated that it was very unlikely that additional treatment time would be successful in reaching acceptable contaminant levels). Based upon the treatability study, it is predicted that full-scale implementation of biological treatment would also be inadequate in treating PAH-contaminated soil. The treatability study also demonstrated that the soil could be classified as non-hazardous which changed the costing assumptions for the landfill disposal options resulting in lower disposal costs. Therefore, the treatability study provides the primary reason for

Contaminant of Concern	RL	Basis of Goal
Napthalene	584	NC DENR
2-Methylnapthalene	30,000	SSL
Carbazole	500	SSL
Benzo(a)anthracene	343	NC DENR
Chrysene	1,000	SSL

Notes:  
 RL = Remediation Level in microgram per kilogram ( $\mu\text{g}/\text{kg}$ )  
 SSL = USEPA Region III Soil Screening Level (Note that USEPA Region IV has no Soil Screening Level criteria)  
 NC DENR = North Carolina Department of Environment and Natural Resources

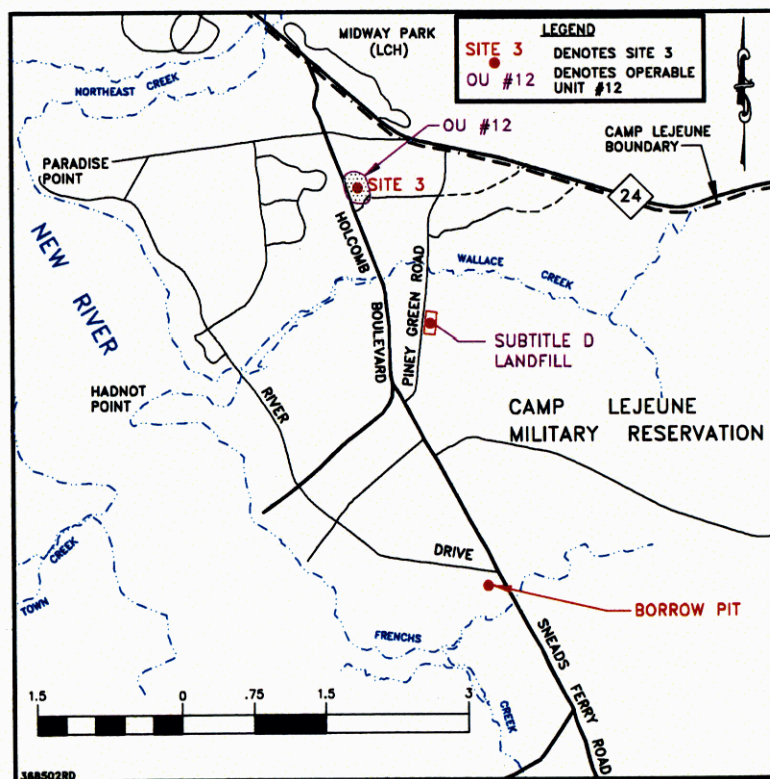
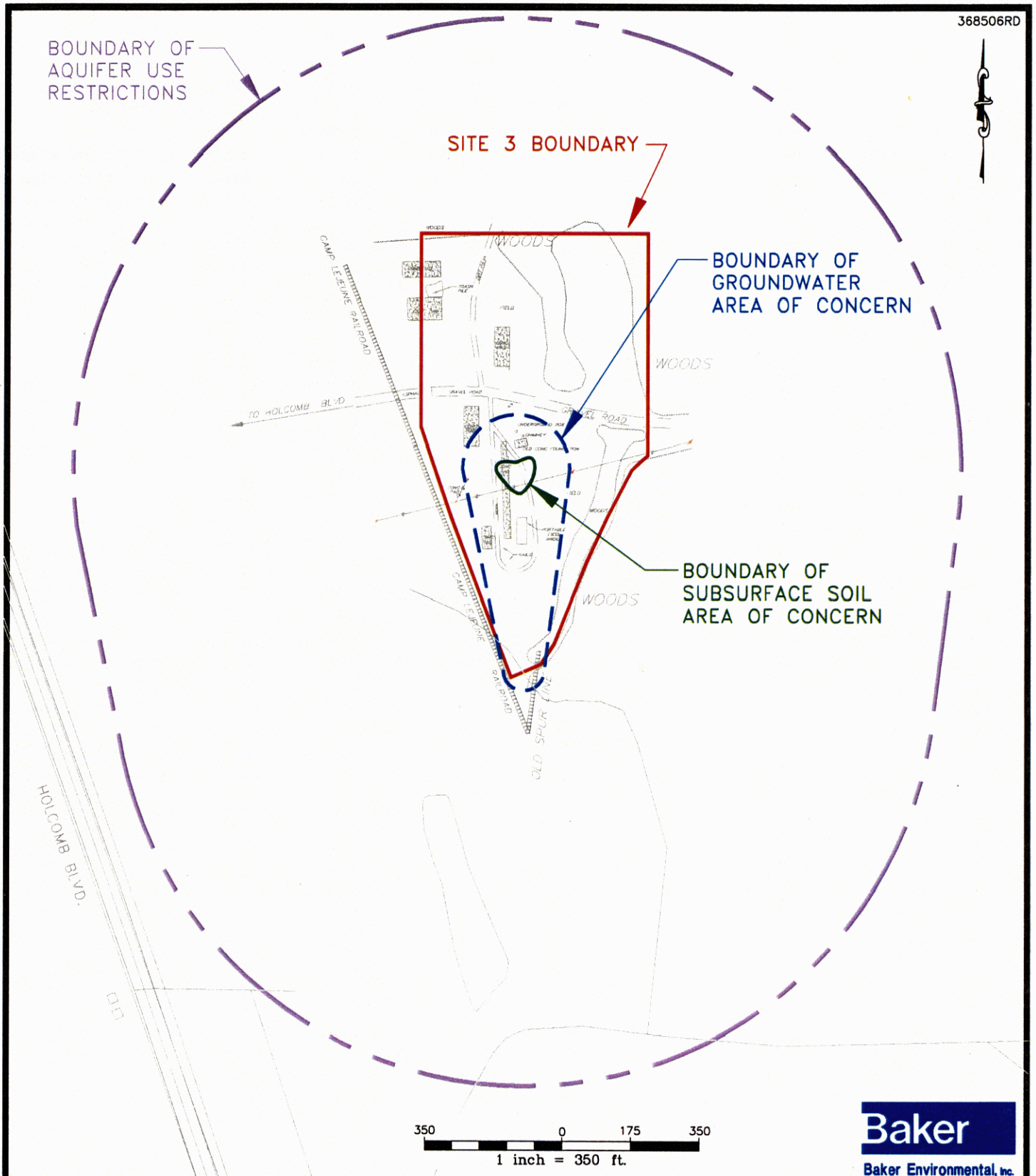


Figure 1 - Operable Unit No. 12 (Site 3) Location Map  
page 2



### LEGEND

- GROUNDWATER AREA OF CONCERN (SHALLOW AQUIFER)
- SUBSURFACE SOIL AREA OF CONCERN
- AQUIFER USE RESTRICTION

FIGURE 2  
AREAS OF CONCERN AND  
BOUNDARY OF AQUIFER  
USE RESTRICTIONS  
SITE 3 - OLD CREOSOTE PLANT  
MARINE CORPS BASE, CAMP LEJEUNE  
NORTH CAROLINA



the fundamental change to the selected remedy for the subsurface soil at OU No. 12 (Site 3). An alternative soil remedy had to be selected for the site, presenting a fundamental change to the original PRAP and requiring the submittal of this Amended PRAP. The amended soil remedy now being proposed includes the removal of the PAH-contaminated soil and disposal in a permitted landfill.

The preferred RAA for groundwater (Aquifer Use Restrictions and Monitored Natural Attenuation) includes aquifer use restrictions to prohibit future use of the surficial aquifer within 1,000 feet of the estimated groundwater plume (See Figure 2). Filing of a Notification of Inactive Hazardous Substance or Waste Disposal Site or "Notice" with the Onslow County courthouse in Jacksonville, NC will also be completed for this RAA. Although not included in the original ROD, the Amended ROD will include the filing of the Notice as required by North Carolina State Code. This does not change the preferred RAA for groundwater. Additional information on this alternative may be obtained from the original PRAP and ROD.

## **SUMMARY OF ORIGINAL AND AMENDED SOIL REMEDIES**

The original soil remedy, Source Removal and Biological Treatment, was the preferred alternative for remediation of PAH-contaminated soils located at OU No. 12 (Site 3) as detailed in the original PRAP dated October 23, 1996 and as specified as the selected alternative in the original Final ROD, signed April 3, 1997. However, due to results from the treatability study, an alternative remedy was chosen for the PAH-contaminated soils. The amended remedy is Source Removal and Landfill Disposal. Both remedies (original and amended) are discussed in further detail below.

### **Original Soil Remedy: Source Removal and Biological Treatment**

The original soil remedy selected for Site 3 included excavation of contaminated subsurface soils and biological treatment of those soils in either an existing on-Base biocell at Lot 203 or in a newly-constructed biocell at Site 3. The subsurface soil area of concern at Site 3 (Figure 2) would be excavated to a depth of nine feet below ground surface (bgs). Confirmatory soil samples would be collected from the excavation area to ensure that contaminated soil above the water table was removed to established remediation levels (See Table 1, page 2). The excavated soil (approximately 1,340 cubic yards) would undergo aerobic, solid-phase biological treatment. The biological treatment would be conducted using land farming technology within a controlled unit (the "biocell"). The contaminated soil would be placed in a 12 inch lift underlain by a 24 inch lift of coarse sand, a high density polyethylene geomembrane liner, and a non-woven geotextile fabric. Leachate would be collected by a leachate collection line and sump, and periodically resprayed back onto the contaminated soil. Maintenance of the biocell would consist of periodic leachate collection and respraying, soil tilling, nutrient and fertilizer addition, and soil sampling.

The capital cost estimated for the original soil remedy was approximately \$362,000. Operation and maintenance (O&M) costs were estimated to be approximately \$35,000 annually, resulting in a net present worth (NPW) of \$514,000 for this RAA.

### **Amended Soil Remedy: Source Removal and Landfill Disposal**

The amended soil remedy proposed for Site 3 includes excavation of PAH-contaminated soils and disposal of the soils in a permitted Subtitle D landfill facility. The subsurface soil area of concern, which is considered a source of groundwater contamination at Site 3, would be excavated to a depth of nine feet bgs. Figure 2 depicts the location of the soil area of concern. Confirmatory soil samples would be taken from the excavation area to ensure that PAH-contaminated soil above the water table has been removed to the acceptable remediation levels (See Table 1, page 2). The excavated soil located from 0 to 3 feet bgs (approximately 660 cubic yards) would be analyzed for semivolatile organic compounds (SVOCs) and later used as backfill for the excavation area provided the soil does not contain PAHs in excess of the remediation levels. Based upon results from the treatability study, which indicated that the PAH-contaminated soil was nonhazardous, the excavated soil located from 3 to 9 feet bgs (approximately 1,340 cubic yards) would be transported to a Subtitle D landfill located either on-Base or off-site. The amended soil cleanup remedy differs from a similar alternative originally evaluated in the FS, Soil RAA No. 3: Source Removal and Off-Site Landfill Disposal. The original alternative was developed assuming that the soil was hazardous and would have to be hauled to an off-site Subtitle C landfill at a much greater cost. Excavated soils must be tested for Toxicity Characteristics Leaching Procedure (TCLP) characteristics to verify the nonhazardous classification prior to disposal in a Subtitle D landfill. The excavated area would be backfilled with clean fill from an on-Base borrow pit and/or "clean" soil removed from Site 3. (The location of the on-Base borrow pit is shown in Figure 1.)



At Site 3, the subsurface soil area of concern appears to be the main source of groundwater contamination (via contaminant leaching). As a result, source removal alternatives were considered to be more appropriate than leaving the soil in place and untreated. Under this source removal alternative, contaminants that could potentially leach would be removed from the subsurface and disposed at either an on-Base landfill or an off-site landfill which is permitted to accept contaminated soil from this site. Although the subsurface soil area of concern would be removed under this amended remedy, a 5-year review by the lead agency will still be required due to the contaminated groundwater remaining at the site (refer to the original ROD).

The NPW for the amended soil remedy was estimated to be approximately \$318,000 for the on-Base landfill option and \$864,000 for the off-site landfill. The original alternative presented in the FS for source removal and landfill disposal was estimated at \$920,000 since it was assumed that hazardous disposal would be required. As stated above however, the treatability study indicated that the PAH-contaminated soil was non-hazardous, thereby reducing disposal costs.

## **EVALUATION OF ORIGINAL AND AMENDED SOIL REMEDIES**

This section summarizes the detailed evaluation of the original and the amended soil remedies. During the evaluation, the soil remedies were comparatively evaluated using seven USEPA evaluation criteria: overall protection of human health and the environment; compliance with applicable and relevant or appropriate requirements (ARARs) and to-be-considered criteria (TBCs); long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost.

### **Overall Protection of Human Health and the Environment**

This criteria addresses whether or not an alternative provides adequate protection and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment engineering or institutional controls. Both the original and amended soil remedies would significantly reduce the human health risks associated with groundwater by completely removing a potential source of the groundwater contamination - the subsurface soil area of concern above the water table. Both of these remedies are source removal alternatives; therefore, they would prevent the further leaching of PAH contaminants from the subsurface soil (at 3 to 9 feet bgs) to the groundwater. Because ecological risks were determined to be insignificant, conditions at Site 3 are already considered to be protective of the environment. As a result, both of the remedies would provide overall protection of the environment. The biocell included under the original soil remedy could potentially present risks to terrestrial receptors. However, if the biocell is properly controlled, these ecological risks would be negligible.

### **Compliance with ARARs/TBCs**

This criteria addresses whether or not an alternative will meet the ARARs, TBCs, and other federal and state environmental statutes, and/or provide grounds for invoking a waiver. No chemical-specific ARARs apply to soil contaminants. Since soil contaminants that exceed the federal soil screening levels would be removed from the subsurface under both of the remedies, soil conditions at the site would meet chemical-specific TBCs. Both soil remedies can be designed to meet all of the location- and action-specific ARARs/TBCs that apply to them.

### **Long-Term Effectiveness and Permanence**

The long-term effectiveness and permanence criteria refers to the magnitude of residual risk and the ability of an alternative to maintain reliable protection of human health and the environment over time once cleanup goals (remediation levels) have been met. Both of the soil remedies provide high levels of long-term effectiveness and permanence. Under each of these remedies, the subsurface soil area of concern would be completely removed (to the level just above the groundwater), preventing contaminants from leaching into the groundwater.

### **Reduction of Toxicity, Mobility, or Volume Through Treatment**

The reduction of toxicity, mobility, or volume through treatment criteria refers to the anticipated performance of the treatment options that may be employed within an alternative. The original and amended soil remedies each involve the removal and treatment and/or disposal of PAH-contaminated soils. The amended soil remedy (Source Removal and Landfill Disposal) does not satisfy the statutory preference for treatment. Although the original soil remedy would satisfy the statutory preference for treatment, the treatability study indicated the solid-phase biological treatment of the PAH-contaminated soil could not achieve all of the treatment criteria for the target PAH constituents.



### **Short-Term Effectiveness**

Short-term effectiveness refers to the speed at which the alternative achieves protection, as well as the remedy's potential to create adverse impacts on human health and the environment that may occur during the construction and implementation period. Both the original and amended soil remedies will generate potential risks during soil excavation and backfilling activities. The Source Removal and Landfill Disposal remedy could generate potential risks during transportation of the contaminated soil to the disposal facility. The Source Removal and Biological Treatment remedy could generate potential risks during the initial placement of the contaminated soil in the biocell, and during the treatment O&M. The following measures would be taken to provide adequate community and worker protection for both of these remedies: proper materials handling procedures, personal protective equipment, and construction safety fencing. A cover/liner system and periodic maintenance checks would provide additional protection for the treatment cell associated with the original remedy. Neither of the soil remediation alternatives would present significant environmental impacts.

### **Implementability**

The implementability criteria refers to the technical and administrative feasibility of an alternative, including the availability of materials and services required to implement the chosen solution. Both of the selected remedies are similar in that they involve excavation of contaminated soils. However, they vary in the treatment and disposal methods. The original remedy includes biological treatment of the soils, which requires mixing of the excavated soil with bulking agents and additives, and long-term O&M of the biocell. The amended soil remedy includes transportation of the contaminated soils to an approved disposal facility, which requires appropriate material handling procedures.

### **Cost**

Cost includes capital and O&M costs for each alternative. For comparative purposes, NPW values are provided. Approximately 1,340 cubic yards of PAH-contaminated soil will require disposal in a Subtitle D landfill. There is an on-Base Subtitle D landfill located along Piney Green Road, approximately one mile from Site 3. The NPW for disposing of the soil in this landfill is estimated to be approximately \$318,000. However, if disposal in the on-Base landfill is not possible, an off-site facility located within 300 miles of the Base would be used for disposal at a cost of approximately \$864,000. The estimated NPW of implementing the original soil remedy (biological treatment) was approximately \$514,000. Therefore, in a comparison of the original and the amended soil remedies, the most cost effective alternative could be the Amended RAA if the on-Base landfill is used, and the original alternative would be more cost effective if an off-site landfill facility is used to implement the Amended RAA. However, when evaluating each remedy considering the results of the treatability study, it would not be feasible or cost effective to treat the contaminated soil in the biocell since the treatability study proved that solid-phase biological treatment of the PAH-contaminated soil could not achieve all of the treatment criteria for the target PAH constituents.

### **DETERMINATIONS REQUIRED BY THE NATIONAL CONTINGENCY PLAN**

The following information is provided in accordance with the National Contingency Plan (NCP). Since this is an Amended PRAP, some of the required information will refer to the original PRAP dated October 23, 1996.

#### **Summary of Alternatives Presented in Feasibility Study (FS)**

Based upon the response action developed for Site 3, remedial action alternatives were developed and evaluated. Five original alternatives were developed for subsurface soil and presented in the FS:

- Soil RAA No. 1: No Action
- Soil RAA No. 2: Land Use Restrictions
- Soil RAA No. 3: Source Removal and Off-Site Landfill Disposal
- Soil RAA No. 4: Source Removal and Off-Site Incineration
- Soil RAA No. 5: Source Removal and Biological Treatment

Three alternatives were developed for groundwater:

- Groundwater RAA No. 1: No Action
- Groundwater RAA No. 2: Aquifer Use Restrictions, and Monitoring
- Groundwater RAA No. 3: Extraction and On-Site Carbon Adsorption Treatment

A summary of each of these alternatives is presented in the original October 1996 PRAP. The new proposed cleanup remedy, Source Removal and Landfill Disposal, is presented in this Amended PRAP.

**The Preferred  
Alternatives**

The new preferred cleanup remedy for subsurface soil is Source Removal and Landfill Disposal. This amended remedy was developed based on results of a treatability study which indicated that the remedy selected in the original ROD for the site could not effectively treat all contaminants of concern to meet remediation goals.

This amended PRAP does not change the selected remedy for groundwater presented in the original Final ROD, signed April 3, 1997. The selected remedy in the original ROD for groundwater (Aquifer Use Restrictions and Monitored Natural Attenuation) includes aquifer use restrictions to prohibit future use of the surficial aquifer within 1,000 feet of the groundwater plume (See Figure 2). Although not specified in the original ROD, the amended ROD will include a requirement to file a Notification of Inactive Hazardous Substance or Waste Disposal Site ("Notice") at the Onslow County Courthouse in Jacksonville, NC. Additional information on the selected remedy for groundwater may be obtained from the original PRAP and ROD documents.

**Summary of Formal  
Comments Received**

Based on results of the treatability study, the EPA and the State of NC have informally indicated their intent to concur with the fundamental change to the preferred soil alternative. However, these agencies have not issued formal comments.

**Summary of ARAR  
Waivers**

There are no ARAR waivers associated with the amended preferred alternative for soil. There are no ARAR waivers associated with the selected remedy for groundwater which remains unchanged from the original ROD.



## PUBLIC PARTICIPATION

The DoN encourages public participation in their environmental program. This Amended PRAP for OU No. 12 is available for public review and comment. The 30-day public comment period will begin on August 28, 1998 and end on September 26, 1998. During the comment period, any member of the public may request that a meeting be held to review the Amended PRAP. If requested, the public meeting will be held in Jacksonville, NC on the evening of September 29, 1998. Comments received during the comment period or at the public meeting will become part of the Administrative Record for MCB, Camp Lejeune. Responses to comments will be presented in a Responsiveness Summary and published within the Amended ROD. The locations where this document and other relevant reports can be reviewed are as follows:

Onslow County Library  
58 Doris Avenue East  
Jacksonville, NC 28540  
(919) 455-7350  
Mon - Thur 9:00 am to 9:00 pm  
Fri - Sat 9:00 am to 6:00 pm

MCB, Camp Lejeune  
Environmental Management Division  
Building 58, Room 236  
Marine Corps Base  
Camp Lejeune, NC 28542  
(910) 451-5068  
Mon-Fri 7:00 am to 3:00 pm

This document is also available on the Internet at the following address:

<http://www.bakerenv.com/camplejeune>

Your written comments can be provided to the following points of contact:

Mr. Neal Paul  
Commanding General  
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## ACRONYMS AND ABBREVIATIONS

ARAR	Applicable or Relevant and Appropriate Requirement	PAH	Polynuclear Aromatic Hydrocarbon
bgs	Below Ground Surface	POL	Petroleum, Oil, and Lubricants
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act	PRAP	Proposed Remedial Action Plan
DoN	Department of Navy	RA	Risk Assessment
FFA	Federal Facilities Agreement	RI	Remedial Investigation
FS	Feasibility Study	ROD	Record of Decision
IRP	Installation Restoration Program	RL	Remediation Level
MCB	Marine Corps Base	RAA	Remedial Action Alternative
µg/kg	Micrograms per Kilogram	SSL	Soil Screening Level
NCDENR	North Carolina Department of Environment and Natural Resources	SVOC	Semivolatile Organic Compound
NPW	Net Present Worth	TBC	To-Be-Considered Criteria
O&M	Operation and Maintenance	TCLP	Toxicity Characteristic Leaching Procedure
OU	Operable Unit	USEPA	United States Environmental Protection Agency